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NOTES ON HEUDE'S BEARS IN THE SIKAWEI MUSEUM, AND ON THE BEARS OF PALÆARCTIC EASTERN ASIA

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Since the publication in 1897 to 1901 of Père Heude's "Memoires concernant l'Histoire Naturelle de l'Empire Chinois" there has been considerable confusion in regard to the status of many of the species of mammals that he named or described. His views on the classification of animals were such as to lead the worthy naturalist to name and describe a great many species upon such slender grounds, that he produced a state of confusion bordering on chaos in the orders and families he touched. Often he published bare names without any descriptions, or at best with fragmentary illustrations.

Thus it comes about that mammalogists have experienced considerable difficulty in satisfactorily determining the status of the Chinese species of the genera *Sus*, *Nemorhædus*, *Urotragus*, and *Ursus*, as well as of the members of the family *Cervidæ*. Through the courtesy of the Jesuit Fathers in charge of the famous Sikawei Museum, Si-ka-wei, Shanghai, I was able in 1915 to examine much of the material upon which Heude based his names and descriptions, and so to determine with, I think, some degree of accuracy the status of the species concerned belonging to the genera and family mentioned. The results, in part, were published in a paper "On Heude's Collection of Pigs, Sika, Serows, and Gorals in the Sikawei Museum, Shanghai," in the *Proceedings of the Zoological Society of London*, April, 1917, pp. 7-26.

The present paper deals with the various species of bears found in China and neighboring eastern Asia, and is based on the examination of various skulls in the Sikawei Museum, in the Smithsonian Institution, and in my own collection.

Lest the aims of the founder and of the present proprietors of the Sikawei Museum should continue to be misunderstood, as it would seem they have been in the past, the present opportunity may be taken to state that this institution is intended to be a working museum, where good and useful scientific research may be carried out in the various branches of natural history that come within its sphere of influence. It is not merely a show place, as are so many of the museums founded and maintained by missionary societies in China. This accounts for the fact that the proprietors are reported to have refused all offers of purchase tendered by European or American museums.

Heude passed away in the midst of his labor and his work has never been completed, though Père Courtois, his successor and present curator of the museum, has attempted in the fifth volume of the *Mémoires*, published after Heude's death, to clear up the vexed question of the status of the Chinese, Japanese, and Manchurian bears. The conclusions he arrives at do not agree entirely with my own, notably in regard to Heude's *Ursus leuconyx* and Lydekker's *U. arctos yessoensis*, both of which in my opinion he places in the wrong groups or genera.

Doubtless had Heude lived to complete his work—if such work can ever be considered complete—he would have modified his views to a large extent, and reduced the number of names of species that he created.

It is to be hoped that the present attempt to clear up the subject of the names of the bears of eastern Asia, and of China in particular, will meet with the approval of the proprietors of the Sikawei Museum, without whose permission to go over and study the material it contains, nothing short of extended and costly explorations in the field could have enabled mammalogists of Europe and America to understand the species under discussion.

In the family *Ursidæ* comparatively little has been done in China, and but little is known of the bears that occur there. Although ancient Chinese writings and pictures give evidence that bears once occurred in various places, while the natives preserve semi-mythical accounts of what they call *Kou-hsüing*, *Jên-hsüing*, and *Ma-hsüing*, or dog-bears, man-bears, and horse-bears, occurring in many of the wilder parts of the country, it is probable that these animals have not been known in the greater part of Chihli, Shansi, North Shensi, Shantung, and northern and eastern Kansu for a considerable period of time, probably for centuries.

The writer has received persistent and fairly reliable reports of the occurrence of bears in the Tung Ling (Eastern Tombs) area to the

north-east of Peking in Chihli, where high, forested mountains occur. Swinhoe reported having seen bears in the hills of the Shantung Promontory. Bears undoubtedly occur in western Honan, north-western Hupeh, southern Shensi, and southern and western Kansu. They also occur in Ssü-chuan (Szechuan), and the maritime provinces of Chekiang and Fokien; while they are positively numerous in the forests of Manchuria and north-eastern Corea. In the islands off the east Asiatic coast they are known from Great Shantar Island, in the Okhotsk Sea, near the mouth of the Amur, from Saghalin, Yezo, Japan, Formosa, and Hainan Island.

It is only to be expected that in so large and varied an area a number of different species occur. But few specimens, however, have reached European or American museums, so that Heude's collection of skulls is of peculiar interest and importance, and their proper examination throws much light upon this hitherto imperfectly understood subject.

Representing the *Ursidæ* there are in the Sikawei Museum some twelve skulls from various localities as follows:—

1. A skull labelled *Selenarctos leuconyx* from the "montagnes de Pao-ki (Chensi boreal), 1886, Mars, Mgr. Vidi."

N.B. Pao-ki, or Pao-chi, is not in North Shensi, as Heude seems to have supposed, but lies to the west of Si-an Fu, south of the Wei River, at the foot of the great mountain system known as the Tai-pei Shan, in the Ching Ling range, where the late Mr. Malcolm P. Anderson discovered the famous Chinese takin (*Budorcas bedfordi* Thos.).

2. Two skulls from Hakodate (Yezo, Yezo, or Jeso), north Japan.
3. A skull from Moupin (N. W. Ssü-Chuan and Tibet.)
4. An immature skull from the Ussuri region.
5. An immature skull labelled Kamschatka.
6. A skull labelled "bought from a pedlar of bric-a-brac in Chang-hai (Shanghai), Malaisie?" with *Selenarctos* written on the skull itself.
7. A skull from Vladivostok.
8. A skull from the "District de Behring."
9. Three skulls of the Malayan bear, labelled "*Helarctos*."

I could not find the skulls of Heude's *U. melanarctos* or *Melanarctos cavifrons*, and so was forced to make use of the figures in his plates for these.

In making my examination of these specimens I had with me three skulls and photographs of a fourth for comparison. One of these skulls was that of a female black bear from the Himalayas, shot by Captain H. L. Haughton of the 36th Sikhs, who gave it to me when

he was in Tientsin with his regiment. The other two skulls were of a fully adult male and a fully adult female of the Manchurian black bear, secured by me in the forests of North Kirin, I-mien-p'ò district (near Ninguta); while the photograph was of the skull of a large grizzly-like bear shot by me in the same district.

After a careful examination of the skulls I had at my disposal, and a comparison of these with the figures in Heude's *Memoires* and Courtois' note, and with due reference to other literature on the subject, I come to the conclusion that the bears of the regions under discussion are divisible into several generic groups, but three of which directly concern us here. These are:

1. *Selenarctos* HEUDE (= *Arcticonus* Pocock).
Type. *Ursus thibetanus* Cuv.
2. *Ursus* LINNÆUS (= *Ursarctos* Heude).
Type. *Ursus arctos* Linnæus.
3. *Spelæus* BROOKES (= *Danis* Gray, and Pocock;
Spelæarctos E. Geoffroy; and *Melanarctos* Heude).
Type. *Ursus spelæus* Rosenmüller.

In thus dividing the bears of these regions that were formerly all placed in the one genus *Ursus* into three genera, I am conforming to the tendencies of modern systematists, and am bringing these groups into line with *Thalarctos*, the polar bear; *Euarctos*, the North American black bear; *Tremarctos*, the South American spectacled bear; *Melursus*, the Indian sloth-bear; and *Helarctos*, the Malayan sun bear.

As a matter of fact Mr. R. I. Pocock,¹ has preceded me in this form of classification, but his *Arcticonus* is, unfortunately, synonymous with Heude's much earlier *Selenarctos* for the bears of the *Ursus thibetanus* group; while his revival of Gray's *Danis* for the group to which the grizzlies belong cannot stand, since that name was first used by Fabricius for a genus of insects in 1808, and so was preoccupied, Gray having applied it to the grizzlies in 1825.

I. *Selenarctos* Heude, 1901

Mémoires concernant l'Histoire Naturelle de l'Empire Chinois, vol. V, p. 2, 1901.

Type:—*Ursus thibetanus* Cuvier.

The bears in this genus belong to the Himalayan black bear, *Ursus thibetanus* Cuv., group, and are characterized by having a pure black

¹ See R. I. Pocock's valuable papers on this subject in the P. Z. S., 1914, pp. 889-941; Ann. Mag. Nat. Hist., ser. 8, vol. XX, pp. 128-130, 1917; and *ibid.*, ser. 9, vol. I, pp. 375-384, 1918.

pelage, with a conspicuous white crescentic collar on the chest, often also with a white chin; long, rounded ears; longish hair; and the plantar and carpal pads joined together, but separate from the digital pads.

It contains the species: *Selenarctos thibetanus* (Cuv.) (= *U. torquatus* Blanford), *S. mupinensis* Heude, *S. macneilli* (Lydekker), *S. ussuricus* Heude, *S. japonicus* (Schlegel), and *S. formosanus* (Swinhoe), as well as the black bears from Chekiang, Fukien, and Hainan Island.

The skulls I examined belonging to this group were No. 2, the two skulls from Hakodate, No. 4, the Ussuri skull, No. 5, the skull labelled Kamschatka, No. 6, the skull bought from the Shanghai pedlar, my own two skulls from Manchuria, one of which, the male, I subsequently sent to the Smithsonian Institution, and the one given me by Captain Haughton from the Himalayas, altogether nine skulls from seven localities. Both Heude and Courtois wrongly classed the species *leuconyx* Heude, from Shensi with this genus. It rightly belongs to *Ursus*, and so the skull representing it cannot be considered here.

In creating the genus *Selenarctos* Heude paid no attention to the South American genus *Tremarctos*, in which Pocock for sometime included the bears of the *thibetanus* group, after having separated them from *Ursus* on their external characters. The latter authority, however, in his recent paper in the *Annals and Magazine of Natural History*, series 8, vol. 20, p. 129, 1917, has at last separated, under the name *Arcticonus*, the *thibetanus* group from *Tremarctos*, basing this separation on cranial characters—*Tremarctos* having a much shorter skull than the bears of the *thibetanus* group—, and remarking that there are probably differences in the feet and nose which will be revealed when fresh specimens can be examined.

There is no doubt that Heude meant the bears of the *thibetanus* group when he created the new generic name *Selenarctos*, for he specifically mentioned Cuvier's *Ursus thibetanus*, and enumerated others, *mupinensis*, *ussuricus*, and *japonicus*, as species which were commonly confused with it, being of a black pelage with the white crescent on the chest. The name *Selenarctos* therefore takes precedence over *Arcticonus*, and as first reviser of the group I select Cuvier's *Ursus thibetanus* as the type of *Selenarctos*, Heude having failed to choose one.

Taking the skulls of the bears of this group that I examined, I found that the one bought in Shanghai (No. 6.) bore a close resemblance to that of the male bear from Kirin, but was narrower throughout, especially across the forehead; while the posterior molar in the upper jaw was very much smaller than that of the latter (25 mm. x 14.5 mm.

as compared with 30 mm. x 16 mm.). In this respect it came nearest to the Himalayan skull, in which the same tooth was 24 mm. x 14.5 mm. On the other hand the Himalayan skull was broader, proportionately, than the Kirin one, so that this skull could hardly belong to *thibetanus* (erroneously known as *torquatus* Blanford). Taking all the facts into consideration this skull probably came from Chekiang or Fokien, and represents an undescribed species, but since this cannot be proved it is unprofitable to discuss the specimen further.

1. *Selenarctos thibetanus* (Cuvier)

Ursus thibetanus CUVIER, Mam., 1824, pl. 213.

Ursus torquatus BLANFORD, S. S. S., II, 1841, p. 144, pl. 141 D.

Type locality:—"Sylket and Nepal."

That Wagner was wrong in substituting Blanford's name *torquatus*² for Cuvier's *thibetanus* on the grounds that it was a misnomer because "Sylket and Nepal" are not in Tibet is evident. Such a procedure does not conform with those laid down in the International Code. Since, then, the same species extends from Nepal right through the Himalayas, its name must be *thibetanus*, and Blanford's *torquatus* becomes a synonym.

The chief point of difference between this and the next species, *mupinensis* Heude, lies in the size of the posterior molar in the upper jaw. This tooth in the Himalayan specimen measured 24 mm. x 14.5 mm., and in the Moupin skull (a male) 28 mm. x 15.5. Of course the difference in the sex has something to do with this, but, judging from what occurs in the other species, it does not fully account for the difference in the teeth. It will be noticed that the upper posterior molar of *thibetanus* is very much narrower than in *ussuricus*.

Following are measurements of the skull of the female black bear from the Himalayas:—

	<i>Inches</i>
Greatest length.....	11.0
Greatest width.....	7.5
Inter-orbital space.....	2.94
Greatest width of cranium.....	4.25
Greatest depth of cranium.....	3.87
Width of palate.....	1.75
Depth of muzzle.....	2.38
Width of muzzle.....	2.5
Length of lower jaw.....	7.75
Depth of lower jaw at posterior molar.....	1.75
Depth of lower jaw at angle.....	4.5

² Schreber's *Säugeth.*, *Suppl.* Vol. II, p. 144, 1841.

	<i>mm.</i>
Length of upper posterior molar.....	24.0
Width of same.....	14.5

These measurements show that the Himalayan black bear has a wider and deeper skull than the Manchurian form, and wider than the Moupin form, though the muzzle and palate are narrower. The lower jaw is very much heavier, but has smaller teeth. Another noticeable feature is that the cranial outline of the Himalayan form is more convex, dorsally, than that of the Manchurian form. In external characters the two species *thibetanus* and *ussuricus* are much alike, except that the latter seems to have longer hair on the sides of the head and neck.

The very small size of the upper posterior molar is interesting, as the following table of measurements of this tooth in the various species shows that it increases in size in the species from west to east.

1. Himalayan skull ♀ 24 mm. x 14.5 mm.
2. Moupin skull ♂ 28 mm. x 15.5 mm.
3. Kirin skull ♀ 27 mm. x 15 mm.
4. Kirin skull ♂ 30 mm. x 16 mm.
5. Kamschatka skull (Imm.) 31 mm. x 16 mm.

The Shanghai bought skull, a male, has this tooth measuring 25 mm. x 15 mm., which, allowing for a corresponding difference between male and female in the species to which it belongs, such as exists in *ussuricus*, we must conclude represents a species with an even smaller posterior molar than *thibetanus*.

Habitat:—The range of this bear apparently extends from Nepal, throughout the Himalayas into Southern Tibet.

2. *Selenarctos mupinensis* Heude

Selenarctos mupinensis, HEUDE, Mém. conc. l'Hist. Nat. de l'Emp. Chin., vol. V, p. 2, pl. II, figs. 1, 2, 9, 1901.

Type:—An adult male in the Sikawei Museum, Shanghai.

Type locality:—Moupin (N. W. Ssü-chuan and E. Tibet).

There can be little doubt that the black bear from Moupin is distinct from the Himalayan form on the one hand and the Manchurian form on the other. Its skull is narrower than in *thibetanus*, the same or slightly broader than in *ussuricus*; while the upper posterior molar is larger than in *thibetanus* and smaller than in *ussuricus*.

Habitat:—The range of this species appears to be N. W. Ssü-chuan, S. W. Kausu, and E. Tibet.

3. *Selenarctos macneilli* (Lydekker)

Ursus torquatus macneilli LYDEKKER, Proc. Zool. Soc. Lond., 1909, pp. 607-610.
Type locality:—Ta-chien-lu, W. Ssü-chuan.

There was no specimen of the black bear from western Ssü-chuan in the Sikawei Museum with which to compare those from other parts, but from Lydekker's description of it it would appear to be very distinct. The latter states that this species has smaller cheek teeth than the Himalayan species, and also a broader skull. It thus cannot be placed with *mupinensis*, in spite of the fact that its type locality is so close to that of the latter. It seems to me to represent the black bears that inhabit South Shensi, West Honan, and North-west Hup'eh, as well as Ssü-chuan. In the figure accompanying Lydekker's description the names of the two species from the Himalaya and West Ssü-chuan seem to have been interchanged, or else his description is wrong, and the narrower skull figured really represents his *macneilli*. The latter was further described as having longer and softer hair than *thibetanus*.

Habitat:—The range of this bear is probably from West Ssü-chuan, eastward to West Honan and North-west Hup'eh, and north into South Shensi.

4. *Selenarctos ussuricus* Heude

Selenarctos ussuricus HEUDE, Mém. conc. l'Hist. Nat. de l'Emp. Chin., vol. V, p. 2, pl. II, fig. 10, 1901.

Type:—An immature skull in the Sikawei Museum, Shanghai.

Type locality:—The Ussuri, Eastern Manchuria.

In the immature skull, supposed to be from Kamschatka, the upper posterior molar was 31 mm. in length, while in the Ussuri specimen, a much younger one, and probably a female, the same tooth was only 25 mm. in length. In my specimens from Kirin this tooth was 27 mm. in the female, and 30 mm. in the male. As none of the skulls from other districts showed this tooth to be larger than 28 mm. (i.e., in the male from Moupin), it appears that the large size of this tooth is characteristic of the Manchurian species. Another distinguishing feature is the proportionate narrowness of the skull.

From a comparison of the skulls from Kirin, the Ussuri, and Kamschatka, I do not hesitate to class them together as representing one species, and since Heude has given the name *ussuricus*, accompanied with a figure (upper molar tooth row), though without a description, this name must stand.

This is unfortunate, for the type specimen is a poor one, though, taking into consideration its age, it shows the main distinguishing characters in the skull of the species.

In order to show this more clearly, and to remove any possibility of doubt as regards the distinctness of the Manchurian black bear from any of the more westerly forms, I give the following description and measurements of a fully adult female from the I-mien-p'o district of North Kirin, whose skin and skull now lie in the Smithsonian Institution at Washington.

Adult ♀. U. S. Nat. Mus. No. 199684. Collector's number, 723. Locality, 20 miles north of I-mien-po, N. Kirin, Manchuria. Alt. 700 ft. Shot October 10th, 1914. Presented to the United States National Museum by Mr. R. S. Clark.

Measurements in the flesh:—Length of head and body, 60 inches; tail, 2.4 inches; hind foot (s. u.), 7.9 inches; ear, 6 inches.

Color:—Pure black, with well defined white, crescentic collar on the chest, extending to the forepart of the shoulder; chin white.

The hair is long and soft, increasing in length on the sides of the neck and head to about 8 inches, giving the appearance of a fine mane.

Skull

	<i>Inches</i>
Greatest length.....	11.83
Greatest width.....	7.25
Inter-orbital space.....	2.88
Greatest width of cranium.....	4.0
Greatest depth of cranium.....	3.5
Width of palate.....	1.82
Depth of muzzle.....	2.25
Width of muzzle.....	2.62
Length of lower jaw.....	7.62
Depth of lower jaw at posterior molar	1.51
Depth of lower jaw at angle.....	4.25
	<i>mm.</i>
Length of upper posterior molar.....	27.0
Width of upper posterior molar.....	15.0

The dorsal outline of the skull is fairly straight, slightly convex about the cranium. There is a fairly well pronounced parietal ridge (more pronounced in male), and the skull compared with those of other members of the group is narrower than in the Himalayan form, about the same as in the Moupin form, and broader than in the Japanese form.

The teeth, also, especially the canines, and the upper posterior molar, are larger than in the other forms.

Habitat:—The range of this species probably extends from western Manchuria (W. Heilungkiang Province) throughout the forested areas of that country, eastward to the Primorsk, north-eastward into Kams-

chatka,³ and southward into North Korea. Its northern limit does not appear to have been determined, but it extends at least into the Amur country, though Schrenck did not record it in his great work on that region.

5. *Selenarctos japonicus* (Schlegel)

Ursus japonicus, SCHLEGEL, Handl. Beaf. Dierk. I, p. 42, 1857.

Selenarctos japonicus (Schlegel) HEUDE, Mém. conc. l'Hist. Nat. de l'Emp. Chin., vol. II, p. 2, pl. II, figs. 5, 6, & 7, 1901.

Type locality:—Japanese Islands.

Heude figures in his *Mémoires*, the skull of a bear from Japan, which he refers to Schlegel's *japonicus*. This undoubtedly represents the Japanese black bear, at once distinguishable from the mainland forms of *Selenarctos* by the extreme (for the genus) narrowness of the skull. In this it approaches the *Ursus* group, and is so like the skull labelled *leuconyx* from Pao-chi, Shensi, that Heude and Courtois both classed the latter with *Selenarctos*. A more careful examination of the respective skulls revealed the fact that the *leuconyx* one was longer in the muzzle, and really belonged to *Ursus*.

It is interesting to note that the broadest skulls in this group, with the exception of that of *Selenarctos formosanus* (Swinh.) our next species, which is broader than any other, occur in the extreme west of the known range of the genus, and the narrowest in the extreme east, the intermediate forms, *mupinensis*, and *ussuricus* being intermediate in this respect.

As regards the color and external characters Sclater (*P. Z. S.*, 1862, p. 261) wrote concerning some bears of this species in the London Zoological Gardens at the time:

Our specimens, the largest of which must be nearly full grown. . . . are barely two thirds the size of *Ursus torquatus*. The very distinct white gular band of *Ursus torquatus* is only represented in *Ursus japonicus* by a slight undefined whitish line, which seems likely to wholly disappear. The muzzle is also much blacker in *U. japonicus* than in *U. torquatus*; and instead of the prominent bushy cheeks of *U. torquatus*, the Japanese species appears to have the face clothed only with short hairs, as in *Ursus americanus*.

He also remarks that *S. japonicus* appears to be intermediate between the Himalayan black bear and the American black bear, a fact also born out by the skull of *S. japonicus*.

Habitat:—The Japanese Islands.

³ Corroborative evidence of the existence of this type of bear in Kamschatka is lacking.

6. *Selenarctos formosanus* (Swinhoe)

Ursus formosanus SWINHOE, Proc. Zool. Soc. Lond., 1864, p. 380.

Ursus torquatus formosanus (Sw.) LYDEKKER, Proc. Zool. Soc. Lond., 1909, pp. 607-610, fig. p. 608, c.

Type locality:—Formosa.

This species was first named by Swinhoe, who however gave very meagre details. In 1909 Lydekker gave a figure of a skull of the Formosan black bear, and confirmed Swinhoe's diagnosis of it as distinct from any of the other known forms. Its chief characteristics are its shorter and broader skull, and its broad and short last molar. It thus approaches to the skull in Sikawei Museum that was bought from a pedlar in Shanghai, and to the Himalayan form. Its skull is, however, proportionately shorter and wider than any other known species. Lydekker gives the following measurements: Basal length, 9.1 inches; maximum zygomatic width, 6.95; length of last 3 upper cheek teeth, 2.25.

From the shape and proportions of the skull figured by Lydekker there is no doubt about this form belonging to the genus *Selenarctos*. Swinhoe gave its hair as stiff, and black, and remarked on the presence of a white crescent.

We thus have six recognizable species of *Selenarctos*, and apparently three more unidentified forms, namely: (1) the black bear from Chekiang and Fukien in south-eastern China, a stuffed specimen of which exists in the museum of the North China Branch of the Royal Asiatic Society, Shanghai, the skull unfortunately being inside the specimen, (2) the black bear from Hainan Island, which has been confused with *S. thibetanus* (or *torquatus*), and (3) the black bear that inhabits (but is rapidly becoming extinct) the forested and mountainous country to the north-east of Peking in Chihli, known as the Tung Ling and Imperial Hunting Grounds.

II. *Ursus* Linnæus, 1758

Syst. Nat., Ed. X, I, p. 47, 1758.

Type:—*Ursus arctos* Linnæus. (Scandinavia.)

The bears that belong to what Heude called the *Ursarctos* group, must be placed in the genus *Ursus*, of which *Ursus arctos* of Scandinavia is the type.

These have longer skulls than the members of the *Selenarctos* group, do not have a pronouncedly high forehead, as in *Spelæus* group, and,

as far as is at present known are brown, light buffy-brown, grayish, or whitish in their pelages. There is usually no sign of a white crescentic collar, except sometimes in the very young cubs. The soles of the feet have the plantar and carpal pads cleft across in the hind feet, sometimes with, sometimes without hair in the cleft; while the digital pads are separate. In the forefeet the plantar and carpal pads are separated, the former being reduced to a small round knob. The feet are thus very distinct from those of *Selenarctos*.

The group was represented amongst the skulls I had for comparison by No. 1, labelled *leuconyx* from Pao-chi, Shensi, No. 6, the one from Vladivostok (*mandchuricus*), and No. 7, the one from the Bering region called *beringianus*.

As regards the name *Ursarctos*, it was applied by Heude to the Vladivostok brown bear, *mandchuricus*, and to the Bering skull, the locality of the latter being very vague. Since neither of these can be separated generically, or even subgenerically from true *Ursus*, the name *Ursarctos* cannot be used.

It is in the genus *Ursus* that the greatest confusion seems to reign, due largely to lack of sufficient material from properly identified localities, and to the close connection between this genus and our next, *Spelæus*.

As regards the bears of eastern Asia the following species may for the present be included in the genus *Ursus*:—(1) *Ursus collaris* Cuvier, of Siberia, (2) *U. isabellinus* Horsfield, of the Himalayas, (3) *U. pruinus*, Blyth, of the Himalayas, (4) *U. lagomyiarius* Sewerzow, of central Asia and north-western China, (5) *U. beringianus* Middendorff, of Great Shantar Island, (6) *U. mandchuricus* Heude, of Manchuria and the Amur, and (7) *U. yesoensis* Lydekker, of Yezo or Hakodate.

Of these it is possible that *U. pruinus* and *U. lagomyiarius* may be found to be subgenerically, or even generically distinct from *Ursus*, and possibly more closely allied to *Spelæus*; but until more material from all parts can be gathered for comparative purposes this cannot be determined.

7. *Ursus collaris* Cuvier

Ursus collaris CUVIER, Hist. Nat. Mamm., livr. XLIII, 1824.

This apparently is the brown bear of the true *Ursus* group that inhabits Siberia. Trouessart gives its range as the Ural Mountains, Siberia, Batang, and Tengri-Nor. It is generally supposed to range into Kamschatka, but this is open to doubt. It is rather a light brown, with dark brown rings round the eyes.

8. *Ursus isabellinus* Horsfield

Ursus isabellinus HORSFIELD, Trans. Linn. Soc., vol. XV, p. 322, 1826.

Ursus arctus isabellinus HORS., LYDEKKER, P. Z. S. 1897.

This is the so-called Himalayan snow-bear, or red-bear. It is a very pale form, buffy like *U. syriacus*, from which it differs in having the ears very hairy. It is possible that this species belongs more truly to the cave bears than to the brown bears, and so should be placed in the genus *Spelæus*.

9. *Ursus pruinosus* Blyth

Ursus pruinosus BLYTH, Journ. Asiatic Soc. Bengal, vol. XXII, p. 589, 1858;
LYDEKKER, P. Z. S., 1897, p. 426, pl. XXVII (colored).

Type locality:—Tibetan Himalayas.

The Himalayan blue-bear, as this species is called, is a small species, with long hair of a white and grey above, merging into blackish on the legs and feet. A good account of it has been given, together with a colored figure, by Lydekker in his paper "The Blue Bear of Tibet, with Notes on the Members of the *Ursus arctus* Group," P. Z. S., pp. 412-426, pl. XXVIII, 1897.

As already suggested this species, together with our next, may prove to be generically, or sub-generically distinct from *Ursus*.

10. *Ursus lagomyiarius* Sewerzow

Ursus lagomyiarius SEWERZOW, Fauna Turkestan, 1874.

Ursus lagomyiarius, Sew. PRZEWALSKI, Reis. Mongol. I, 1876.—Cat. Zool. Coll. of H. M. Przewalski, p. 9, no. 1, 1887, St. Petersburg.

This appears to be a close relation of *Ursus pruinosus*, that occurs in the highlands of central Asia, northern Tibet and possibly north-western China. It is larger than *pruinosus*, however, and apparently less white in color.

Another bear belonging to this group, or at least related to it, is that named *Selenarctos leuconyx* by Heude, a skull and paws of which were sent to him from Pao-chi in West Shensi. The name *leuconyx* had already been used by Severtzow (= Sewerzow) in naming a bear from the Altai (*Ursus leuconyx* Severtzow, *Nachr. Ges. Moscou*, VIII, 1873, p. 79, pl. II.), but there is nothing to show that Heude meant to refer the Pao-chi specimen to this species. On the contrary he classed it with the *Selenarctos*, or black bear group, which he had separated from *Ursus*.

Since then the Pao-chi form is distinct from Severtzow's *U. leuconyx*, which nevertheless does not seem to belong to the genus *Ursus*, but to *Spelæus*, and since when Heude used the name *leuconyx* it was already preoccupied by a bear at that time placed in the genus *Ursus*, it cannot now be used for the Pao-chi species, although the latter turns out to belong to *Ursus*, while Severtzow's species seems to belong to *Spelæus*.

The Shensi brown-bear (sic) represented solely by the skull from Pao-chi in the Sikawei Museum therefore requires a new name, and since it has been entirely due to the generosity of my friend, Mr. Robert Sterling Clark, that I have been able to carry out my exploration work in China, Mongolia, and Manchuria, I have decided to name this species in his honor. It may thus be known as:

11. *Ursus clarki* nom. nov.

Selenarctos leuconyx HEUDE, Mém. conc. l'Hist. Nat. de l'Emp. Chin., vol. V, p. 2, p. II, figs. 3, 4, 8, 1898. (*nom. preoc.*)

Type:—A skull in the Sikawei Museum, Shanghai.

Type locality:—Mountains of Pao-chi (*i.e.* the Tai-pei Shan of the Ching Ling Range.), S. W. Shensi.

In this species the skull is narrow, with rather long muzzle and jaws, and a somewhat convex cranial outline. Heude says that the paws of his specimen, which is the type, are white; and this is all that is known of the color of the species. When I was in this locality I made enquiries concerning the form of the bear inhabiting these mountains, and was told that it was whitish in color with some black about it. Later, when hunting in the mountains of the Tai-pei Shan, I came across evidences of the existence of bears there, but did not see a specimen. The species would seem to represent *U. pruinosis* in this region.

Habitat:—Probably the whole, or greater part of the Ching Ling Range, up to 11,000 ft. or 12,000 ft. altitude.

12. *Ursus mandchuricus* (Heude)

Ursarctos mandchuricus HEUDE, Mém. conc. l'Hist. Nat. de l'Emp. Chin., vol. IV, pp. 23-24, pl. VII, figs. 1-1e, 1898.

Type:—A skull in the Sikawei Museum, Shanghai.

Type locality:—The Ussuri region, near Vladivostock, Manchuria.

This is a large mainland brown bear that inhabits the forests of eastern, central (?), and northern Manchuria. I have seen a number

of skins of brown bears from Manchuria, and can say that they are brown, usually a good deal darker than that of *Ursus collaris* Cuv., and are without the brown patch encircling the eye. The color is not so dark as in *U. beringianus* Midd. from Great Shantar Island (not the Bering region), and still less dark than that of *Spelæus piscator* (Puch.) from Kamschatka, with which it and *U. beringianus* might be, and apparently have been confused.

The skull of *U. mandchuricus*, as exemplified by the Sikawei specimen, is very heavy and rugged, with a fairly straight cranial outline, rising but slightly at the forehead. The muzzle is shorter and broader than in the skulls of the next genus, *Spelæus*, though less deep.

Judging from the size of the skull in the Sikawei Museum the species must be a very large one, a fact also born out by the large size of good Manchurian skins.

Habitat:—The range of this species probably extends from the Ussuri northward and westward, embracing the Amur Valley, and possibly extending into Eastern Siberia and Kamschatka.

13. *Ursus yesoensis* Lydekker

Ursus arctus yesoensis LYDEKKER, Proc. Zool. Soc. Lond., 1897, pp. 422–423, fig.

Type in the British Museum collections.

Type locality:—Hakodate, Yezo.

In 1897 Lydekker described a bear from Hakodate under the name *Ursus arctus yesoensis*, giving a figure of a skull. In 1901 Père Courtois in volume V of the *Mémoires* confused this bear with Heude's *melanarctos*, which belongs to our next group. As Lydekker states distinctly that his *yesoensis* is a brown bear, while Heude states equally emphatically that *melanarctos* is pure and deep black, it is obvious that the two forms are distinct. The skull figured by Lydekker does not agree with the characters of *melanarctos*, and is, in effect that of a true brown bear. It has a very convex cranial outline.

Habitat:—The island of Yezo, N. Japan; possibly also Saghalin Island.

14. *Ursus beringianus* Middendorff

Ursus arctos var. *beringiana* MIDDENDORFF, Reis. im. den äuss. Nord. u. Ost. Sibir., vol. I, pt. II, pl. 1, 1851.

Type locality:—Great Shantar Island.

The skull of the bear from the Bering region in the Sikawei Museum agrees, as far as I could make out, with those of true *Ursus*; but there

was no means of ascertaining whether it represented *U. beringianus* or not. Both Heude and Courtois seem to have considered it to belong to Middendorff's species. Its label marked "District de Behring" suggests that it came from very much further north than Great Shantar Island, which is near the mouth of the Amur, in the South Okhotsk Sea, and is the type locality of *beringianus*. In this case the skull probably belongs to some other form.

U. beringianus is a large, dark brown species, to judge from specimens in the Tring Museum. But at best it can only be considered an island form of the mainland *U. mandchuricus*.

Habitat:—Great Shantar Island.

III. *Spelæus* Brookes, 1828⁴

Cat. Anat. & Zool. Muséum of Josh. Brookes, London, 1828.

Type:—*Ursus spelæus* Rosenmüller, (= *Spelæus antiquorum* used by Brookes).

Belonging to this group of bears, to which Heude gave the generic name *Melanarctos*, and which contains the prehistoric cave-bears as well as the recent cave-bears or grizzlies, there are some three species known to occur in eastern Asia, and apparently a fourth in central Asia. These are: (1) *Spelæus melanarctos* (Heude) from Yezo, (2) *S. cavifrons* (Heude) from Manchuria, (3) *S. piscator* (Pucheran) from Kamschatka, and (4) *S. leuconyx* (Severtzow) from the Altai region.

These may be considered the Asiatic representatives of the American grizzlies on the one hand and the extinct European cave-bears on the other.

They are large species, in which the skull is very long and narrow, relatively more so than in *Ursus*, with very high foreheads so that the cranial outline at this point is strongly concave. The cranium itself is very narrow, the muzzle and jaws narrow and deep. The soles of the feet agree very much with those of *Ursus*.

From the general appearance of the skulls of Heude's two species, *S. melanarctos*, and *S. cavifrons*, it is evident that this authority was right in separating these bears from the *Ursus* group. In this connection Mr. Gerrit S. Miller, Jr., referring to a specimen of *cavifrons* secured by me in the Manchurian forests, has written me under date of January 17, 1917, as follows:—

⁴ This name precedes E. Geoffroy's *Spelæarctos*, Rev. Encyclopedique, 59, p. 81, 1833.

Yesterday, in company with Dr. C. Hart Merriam and Mr. James W. Gidley, I compared your skull of Manchurian "*Melanarctos*" (U. S. Nat. Mus. No. 199683) with skulls and teeth of cave bears from the Pyrenees, with the Kamchatkan *Ursus piscator* and the largest grizzlies and brown bears of western North America. We found it impossible to separate these animals by cranial and dental characters into subgeneric groups. Such differences as occur, for instance those distinguishing the extinct Pyrenean bears from living Alaskan species, and those distinguishing your animal from either of these two or from *Ursus piscator*, are no greater than the differences present among various forms now occurring in North America. In other words the characters are merely specific. In its past and present distribution this group of bears resembles some of the lagomorphs and rodents. The genus *Ochotona* ranged west to England in the Pleistocene; it is now confined to Asia and western North America. A Pleistocene *Microtus* of the "*Stenocranius*" group has been found in southern England. The group now ranges from the Altai Mountains to Alaska. Probably there are several other instances of the same kind.

My specimen, referred to by Mr. Miller, is a fine sample of its kind. It was shot by myself in the forest to the north of I-mien-p'o, in Kirin Province, and was sent to the Smithsonian Institution. It and Heude's two specimens of *cavifrons* and *melanarctos* are the only ones of these particular species known to exist in any recognized museum, and are therefore of great importance.

On the question of whether or not this genus is distinct from *Ursus* there seems to me to be little doubt; though it is not quite clear, owing to lack of material for examination, exactly which species belong to which genus.

Pocock has separated the grizzly bears from *Ursus* on the strength of the fact that the skin between the toes extends much further towards the tips in the former than in the latter. He used the name *Danis* Gray (1825), which, as already pointed out, is preoccupied (Fabricius, 1808). Thus Brookes' catalogue name *Spelæus* (1828), based on *Spelæus antiquorum* (= *spelæus*), as the next oldest is the correct one for this group of bears. If, however, as Mr. Miller has pointed out *in litteris*, it should be found that the living 'cave' bears can be separated from their extinct ancestors, then Heude's name *Melanarctos* would be the correct one for the recent group. There seems no way but to accept Brookes' name, in spite of its appearing in a sale catalogue of his collection.

15. *Spelæus melanarctos* (Heude)

Ursus melanarctos HEUDE, Mém. conc. l'Hist. Nat. de l'Emp. Chin., vol. IV, pp. 17-18, pl. VIII, figs. 1-1c, & pl. VII, figs. 2-2a, 1898.

Type:—A skull in Sikawei Museum, Shanghai.

Type locality:—Yezo, N. Japan.

This was the first of the two species to be discovered. It occurs in the island of Yezo, where Heude emphatically declares three species of bear occur, namely *melanarctos*, *yesoensis*, and *japonicus*. He distinguishes *melanarctos* as being of an intense black, with no light markings at all. The skull is large and heavy, with a longer and proportionately narrower muzzle than in the true *Ursus* group. The forehead is high, giving the profile of the skull a concave outline. Heude's description is very meagre, and so far as I am aware no other publication on this animal occurs, excepting that in volume V, of the "Mémoires," in which Courtois confuses this bear with Lydekker's *Ursus yesoensis*.

Habitat:—Yezo Island, N. Japan.

16. *Spelæus cavifrons* (Heude)

Melanarctos cavifrons HEUDE, Mém. conc. l'Hist. Nat. de l'Emp. Chin., vol. V, pt. 1, p. 1, pl. I, figs. 6-8, 1901.

Type:—A skull in the Sikawei Museum, Shanghai.

Type locality:—Tçi-tçi Har (Tsi-tsi-har), N. W. Manchuria.

This bear is very distinct from any of the other mainland forms. It is distinguishable from *Ursus mandchuricus*, which it resembles in size, by its high forehead, narrower and deeper muzzle, black pelage, and coarse hair.

While in the I-mien-p'o district of North Kirin, I secured a specimen of a bear which can only be referred to this species. The skull agrees very closely with Heude's figure. As Heude's description is not as full as it might be, I give the following account of my specimen.

Fully adult ♂. U. S. Nat. Mus. No. 199683. Collector's number, 722. Locality, 20 miles north of I-mien-p'o, N. Kirin, Manchuria. Alt. 700 ft. Shot October 8th, 1914. Presented to the United States National Museum by Mr. R. S. Clark.

Measurements in the flesh. Length of head and body, 79 inches; tail, 5.5 inches; hind foot (s. u.), 10.2 inches; ear, 6 inches.

Color: Generally black, merging into brown on the muzzle; brownish on the head; a band of slightly lighter color over the shoulders, owing to hairs being

of a light chestnut color at their bases; no light or white crescent on the chest. The light color across the shoulders is significant as will be shown further on. Hair very coarse, with little under-wool.

Skull

	<i>inches</i>
Greatest length.....	16.0
Greatest width.....	9.25
Inter-orbital space.....	3.47
Greatest width of cranium.....	4.25
Greatest height of parietal ridge.....	1.5
Depth of muzzle.....	3.5
Width of muzzle.....	3.47
Length of lower jaw.....	11.0
Depth of lower jaw at posterior molar.....	2.25
Depth of lower jaw at angle.....	6.75
Width of palate.....	2.5
Teeth: Upper jaw, 3 molars, 2 premolars, 1 canine, and 3 incisors.	
Lower jaw, 3 molars, 2 premolars, 1 canine, and 3 incisors.	

This bear is a large animal, and owing to its high forehead, and deep muzzle and jaws, of a peculiarly savage appearance. In life the shoulders appear high.

Little is known of the habits of the species. The specimen I shot was very savage and tried repeatedly to attack me after receiving the first shot. The native Russians and Chinese greatly fear this animal, as it has been known to kill and devour hunters. They say it does not hibernate like the black bear. The stomach of my specimens contained nothing but acorns. The animal was estimated to weigh something over 600 lbs., but it was in very poor condition compared with what bears usually are in the autumn. It is known to the Chinese as *Hua Yao-tzu*, meaning 'pied kidneys.'

Habitat:—The range of this species probably extends throughout the forested areas of Manchuria and neighbouring regions. I heard of an animal that answered its description in South Kirin, North Corea, and on the Lower Sungari. Heude's specimen came from Tsi-tsi-har some distance to the north-west of Harbin in the valley of the Nonni Ho, in Dauria.

17. *Spelæus piscator* (Pucheran)

Ursus piscator PUCHERAN, Rev. Zool., 1855, p. 392.

Type:—No type; the species was based on a figure given by I. Geoffroy St. Hilaire in the *Zoology of the Voyage of the Venus*, Mamm. t. 4, as *Ursus arctos* var. du Kamschatka.

Locality:—Kamschatka.

Known as the Kamschatkan fish-bear, this species appears to belong to the cave-bear group rather than to the brown bears. A specimen assigned to this species that used to be in the gardens of the Zoological Society of London, and which I had the opportunity of examining at its death in 1918 reminded me very much of my specimen of *Spelæus cavifrons* in its general appearance. Its hair was softer, however, and of a dark brown color; the ears were full of long hair and were very hairy outside, much as in *U. isabellinus* and *U. pruinus* of the Himalayas; while the forehead was not markedly high. The specimen was not very large, however, and had been kept in captivity a long time, so that the cranial characters are hardly to be considered. In any case the animal looked very different from typical members of the genus *Ursus*.

In 1867 Gray described a species of bear, *Ursus lasiotus* (*Ann. Nat. Hist. ser. 3. vol. 20, p. 301*) which was brought from China alive, and said to be from the interior of North China. Sclater (*P. Z. S. 1867, p. 818*), however stated that the animal probably belonged to *U. piscator* Pucheran, and from what we know of conditions then, the uncertainty attaching to the given locality of specimens from these parts, and the present distribution of this type of bear, it seems probable that Sclater was right. In any case *U. lasiotus* is unidentifiable at present.

18. *Spelæus leuconyx* (Severtzow)

Ursus leuconyx, SEVERTZOW, *Nachr. Ges. Moscou*, vol. VIII, p. 79, pl. II, 1873
Type locality:—Altai Region.

This species appears to belong to the grizzlies, since it is described as having light claws, which is said to be characteristic of the latter group of bears. To it I refer some bears shot by the Fenwick Owen party in 1911 on the Kansu-Tibetan border. In spite of their somewhat light color these belong to the same group as the Manchurian *cavifrons*, if the photographs reproduced in Mr. Frank Wallace's book ("Big Game of Central and West China,") and others I have seen of them are to be relied upon. The adult specimens show the same high forehead, deep muzzle and jaws, and what is more significant a distinct light band across the shoulders; which it will be remembered occurs in an incipient form in *cavifrons*.

This also is a large species, and the specimens referred to above were said to be something like *U. pruinus*. It is this fact, amongst

others, that makes me think it possible that the latter animal, and *U. lagomyiarius*, and possibly also *U. clarki* from the Ching Ling, may ultimately be found to be generically different from true *Ursus*, and possibly referable to *Spelæus*.

NOTES ON WOOD RAT WORK

BY EDWARD R. WARREN

[Plates 10-11]

While collecting at Alma, Park County, Colorado, in the autumn of 1914, I discovered some unusually interesting work of the "mountain rat," or Colorado bushy-tailed wood rat, *Neotoma cinerea orolestes*. This was in an old shafthouse on Buckskin Creek, about a mile from the town of Alma. While I have seen much of the work of this and other species of *Neotoma*, in some respects this was very different from any I have seen elsewhere. Whether the work of one or two of the animals I cannot say, though on one visit to the place I saw two.

The principal accumulation was about the shaft, which was toward the corner of the building, opposite the wide door shown in figure 1. This shaft was a two compartment affair, with manway and bucketway, the former open at the top, the latter covered with the usual sloping doors. About the shaft, but principally about the manhole, and even on top of the timbers, were piled many sticks. The pictures perhaps show better what a mass of stuff was there. The manway measured 30 inches square inside; an outside measurement could not be made, but the base of the pile was 48 inches on one side, and 45 inches on the other; the material was piled steeply, and much of it was green aspen leaves and twigs, just the tips of the branches. As these were often piled 12 inches high and 8 inches thick it will easily be seen that considerable labor was involved in gathering so much. While the accumulation was mainly about the manhole, it also extended somewhat along the bucketway, which was the same width, but a trifle longer.

The blacksmith forge in the shafthouse was on the same side of the building as the door previously mentioned, by the window which can be seen both in the picture of the building and in that of the forge. Here were more of the aspen leaves on the forge itself, on a ledge level with it, and on shelves and ledges above, five piles altogether. The